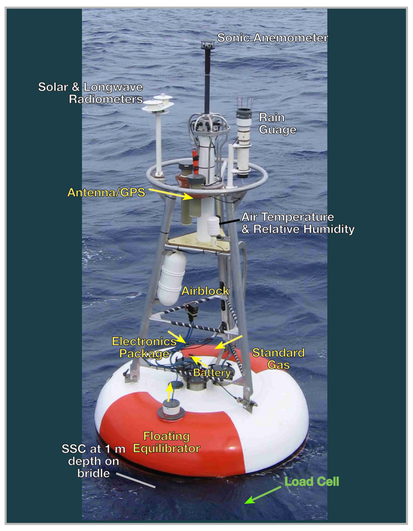
National Oceanic and Atmospheric Administration / Pacific Marine Environmental Laboratory

Kuroshio Extension Observatory (KEO)

KEO, A Time Series Reference Site in the Kuroshio Extension Recirculation Gyre

Meghan Cronin, Chris Sabine, Nick Bond, Chris Meinig

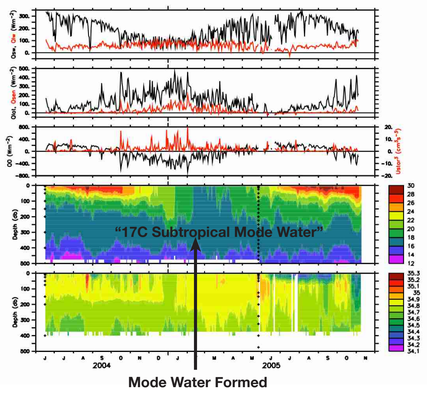
Meteorological and Sea Surface Sensors
Carbon Package



Surface sensors include: solar and longwave radiometers, rain gauge, sonic anemometer, relative humidity, air and sea surface temperature; a load cell; and a carbon dioxide flux package.

Subsurface sensors include: 28 temperature sensors, 15 conductivity sensors (down to 525 m), and 3 current meters (5m, 15m, 35m).

KEO Net Surface Heat Flux and Subsurface Temperature and Salinity



Role of Air-Sea Interaction in the Kuroshio Extension
(a NOAA CVP Project)
M. F. Cronin and N. Bond

How do advective processes replenish heat within the recirculation gyre? What is the role of eddies?

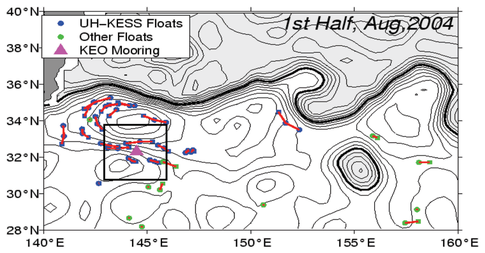
What controls Suubtropical Mode Water (STMW) formation?

How is carbon uptake related to air-sea heat flux? to STMW formation?

How do SST, heat content and KE frontal variations affect storm development and storm path? Are these effects enough to significantly influence the atmospheric circulation?

Are clouds over the KE system related to SST?

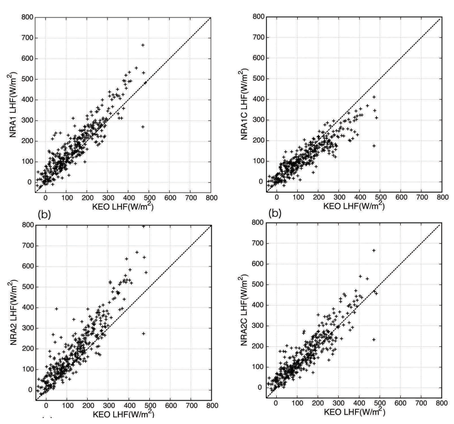
KEO is both an element of the OceanSITES network and an element of the Kuroshio Extension System Study (KESS)



Introduction

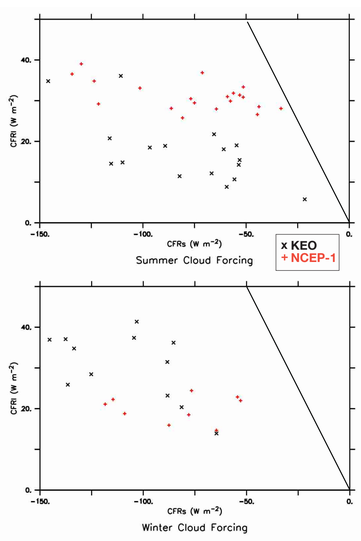
As a component of the global network of OceanSITES time series reference sites, in June 2004, a surface buoy was deployed in the Kuroshio Extension (KE) recirculation gyre. The buoy is about to begin its third deployment year, carrying sensors to monitor the air-sea heat, moisture, momentum, and carbon dioxide flux; and upper ocean temperature, salinity, and currents.

Assessing NCEP-1 and NCEP-2



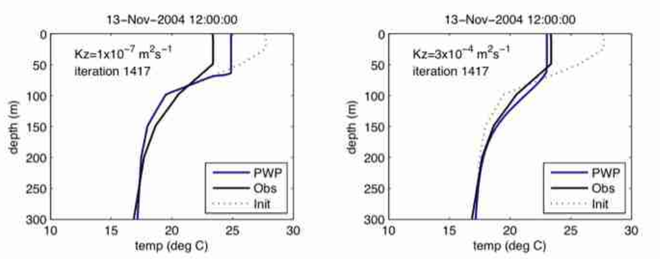
NCEP-1 and NCEP-2 latent heat fluxes are biased high relative to KEO (left column). The biases are significantly reduced if the COARE bulk flux algorithm is used with the NCEP state variables to compute the fluxes (right column)

During Summertime, the biases appear to be associated with southerly wind eventsthat bring in maritime air which is too moist and warm.



Solar cloud forcing (CFRs) and longwave cloud forcing (CFRI) comparisons can be used to assess cloud processes.

Does heat mix down as the seasonal thermocline is eroded? Yes!



Not Realistic:
Kz = molecular diffusivitity. Heat is extracted from surface without mixing heat downward below the mixed layer

Realistic:
Effective diffusivity = $3x10^{-4}$ m^2s^{-1} Heat is extracted from surface and mixed downward below the mixed layer

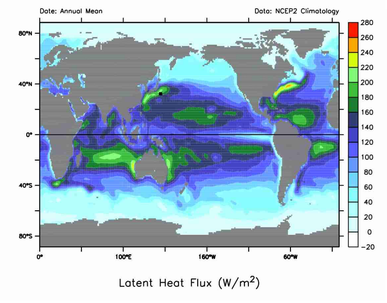
From: Cronin et al. (2006)

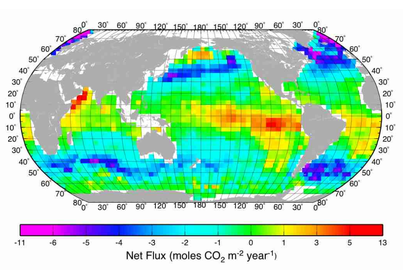
Summary

As part of the global network of Ocean SITES time series reference sites, the KEO project office encourages wide use of the data and welcomes collaborations.

For further information, please see: http://www.pmel.noaa.gov/keo/

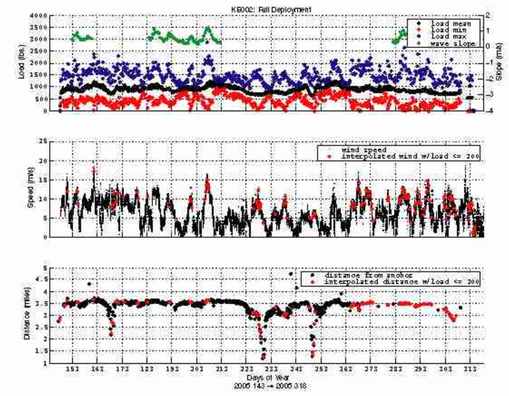
The Kuroshio Extension has some of the largest heat and carbon fluxes found in the entire basin





Engineering Analyses
Designing a buoy for the harsh conditions found in western boundary currents and subpolar regions

Extensive engineering analyses suggest that the nylon break in Nov 2005 was due to a manufacturing defect in the nylon line.



Coincident loadcell, full water column velocity and meteorological data have led to unprecedented analysis of the mooring performance.

Air-sea interaction sites in subpolar regions may need to carry additional sensore (e.g. significant wave height).

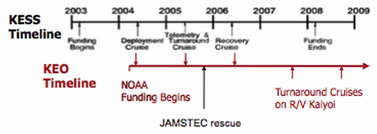
PMEL and ESRL are exploring plans to develop a low-powered wind profiler that could be mounted on a PMEL buoy.

KEO Shiptime

On Nov 6 2005, after more than 16 months of near 100% data return, KEO broke away from its anchor. Within 3 days, the buoy and all its sensors were successfully recovered by Dr. Hiroshi Ichikawa (JAMSTEC) aboard the R/V Kaiyo. Thank you Dr. Ichikawa ! Thank you JAMSTEC !

Photo courtesy JAMSTEC

KEO will be redeployed during the final KESS recovery cruise in May 2006. Subsequent mooring operations will likely be aboard R/V Mirai or Kaiyo on Dr. Ichikawa's mooring cruises.



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